PATENT SPECIFICATION

DRAWINGS ATTACHED

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Int. Cl.: —B 65 b 43/18

COMPLETE SPECIFICATION

Improvements in or relating to Carton Handling

We, JACOB, WHITE & COMPANY LIMITED, of Westminster Mill, Horton Kirby, Dartford, Kent, formerly of Nightingale Works, Gildersome Street, Woolwich, London, S.E.18, a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to carton handling and in particular to apparatus suitable for dealing flat folded stacked cartons and erecting them.

The invention concerns carton handling machines of the type wherein cartons of cardboard or the like having four closure flaps at each end are stacked in their flat condition in a magazine, extracted one by one from the magazine, opened into the usual rectangular sectioned box form, and dispensed to transfer mechanism which transfers them onto a conveyor by which they are conveyed continuously through charging and sealing processes in a well known manner. As the cartons are conveyed by the conveyor the two vertical end flaps on one end are folded inwards and the lower flap folded upwards, whilst on the other end of the upper and lower flaps are spread open so as to allow the insertion of a product into the cartons either by hand as the cartons progress through the machine, or by some form of automatic feed from a parallel conveyor. After the product has been loaded the vertical end flaps on the open end of the carton are automatically tucked inwards and the lower flap is folded upwards. The folding of the flaps can be achieved by means well known in the art, for example ploughs or the like. All the carton flaps are now folded with the exception of the upper flaps on each end which are extended outwards in order to pass over glueing means which applies adhesive to the under side of the flaps which flaps are then folded downwards and passed through a compression section in order to effect a glued seal before the carton is ejected from the processing apparatus. According to requirements the adhesive may either be cold glue or what is known in the art as a "hot melt". Additional arrangements well known in the art may be made for applying glue to both lower and upper flaps of the carton or alternatively the upper or lower flaps may be tucked in instead of being glued.

It is an object of the present invention to provide apparatus for dealing flat folded cartons from a stack thereof, erecting them into box form and passing them, under control, to the transfer mechanism of a carton handling machine.

According to the present invention there is provided apparatus for dealing and erecting flat folded cartons from a stack which includes a take-off member carrying suction cups and arranged to reciprocate towards and from an end carton of the stack and to be displaced laterally of that direction during its reciprocatory movement; during the reciprocatory movement of the take-off member the cups being adapted to engage the end carton of the stack at the end of the approach stroke, withdraw the end carton from the stack during the recession stroke and during the recession stroke move the withdrawn carton so that part of the carton adjacent a folded edge thereof encounters at least one stationary breaker bar which first causes the substantially flat folded carton to be partially opened and further movement of the carton over the breaker bar or bars causes the carton to be further opened into an erect

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or partially erect condition and wherein the take-off member is displaced laterally during the recession stroke to maintain the carton in engagement with the breaker bar or bars and to cause the carton to be partially collapsed in the opposite direction to the direction in which it was collapsed whilst in the stack and in which, on disengagement of the suction cups, the carton is released to transfer mechanism and is maintained in its partially collapsed condition by the breaker bar or bars during initial movement of the carton by the transfer mechanism.

Further according to the present invention there is provided a method of dealing and erecting flat folded cartons from a stack thereof which includes the steps of engaging an end carton of the stack with suction cups and partially deforming the end carton during such engagement to admit air between its opposing sides; withdrawing that end carton from the stack; causing a part of the withdrawn carton adjacent a folded edge to encounter a stationary breaker bar during withdrawal of the carton from the stack; maintaining the withdrawing carton in engagement with the breaker bar until the carton is deformed into an erect or partially erect condition and moving the erect or partially erect carton in a direction laterally to the direction of its withdrawal from the stack whilst maintaining the carton in engagement with the breaker arm to cause the carton to be partially collapsed in the opposite direction to the direction in which it was collapsed whilst in the stack and releasing the suction caps whilst maintaining the partially collapsed carton in engagement with the breaker bar to prevent spontaneous collapse of the carton prior to transferring the carton through a carton handling machine.

The suction cup carrying take-off member may conveniently form part of an articulated frame, which frame can reciprocate in a direction towards and from the end carton of the stack and be deformed to displace the take-off member to move the cups laterally of the said direction.

It will be realised that the expression "deal" as used throughout this specification is defined as to take off successively the outermost flat folded carton from a stack, either from the top or bottom end of a vertical or inclined stack or from a side end of a horizontal stack.

A carton for use in the apparatus and by the method according to the present invention comprises four side walls joined at foldable edges, the geometry of which defines a parallelogram in cross section, the dimension of the carton normal to the plane of the cross section being the length of the carton and the width of the carton being a dimension parallel to a side wall in the plane of the cross section.

One embodiment of the present invention, will now be described, by way of example only, and with reference to the accompanying diagrammatic drawings, in which:—

Fig. 1 illustrates a side view of carton dealing and erecting apparatus constructed according to the present invention and incorporating a suction cup carrying take-off member which forms part of an articulated frame, and also shows part of the transfer mechanism;

Figs. 2 to 5 illustrate the erection and conveyance of a carton to the transfer mechanism;

Fig. 6 illustrates cam means by which synchronisation of the transfer mechanism with the erection and delivery of a carton thereto may be obtained; and

Fig. 7 shows an electrical circuit suitable for use with the cam means illustrated in Fig. 6 for synchronising the transfer of a carton with its erection.

Referring firstly to Fig. 1 the drawing illustrates one side of the carton dealing and erecting apparatus, the apparatus including the transfer mechanism, being duplicated on the other side so that whole of one side of the appparatus may be moved relative to the other side in order to accommodate cartons of different lengths. Flat folded cartons 1 are stacked vertically in a magazine 2 so as to be supported by small ledges 3 on the bottom of the magazine. The cartons are stacked with their lengths normal to the plane of the drawing. The magazine 2 includes four "L" shaped corner members, two of which are shown at 2a and 2b which corner members are slidably mounted to be capable of movement relatively towards or away from each other on a shaft 2c so that they may be set to suit cartons of varying widths. It is thus seen that the whole apparatus may be adjusted for cartons of varying sizes.

Located beneath the magazine 2 are a pair of sprockets 4 which carry a pair of parallel conveyor chains 5. Attached to the conveyor chains 5 are a plurality of rear flights 6. Positioned between the sprockets 4 is a third sprocket (not shown) which carries a third chain (not shown) between and parallel with, the two chains 5. The third chain carries a plurality of front flights 7. The third chain may be adjusted in phase relationship with the sprockets 4 so that the distance between the flights 6 and 7 may be varied to suit different widths of cartons. The sprockets 4 are driven through a shaft 9 which shaft also drives a shaft 8. The ratio between the shafts 8 and 9 is such that the shaft 8 rotates through one revolution during the pitch of the rear flights 6. Attached to the shaft 8 is a cam 10 which co-operates with a cam follower in the form of a roller 11 rotatably attached to a lever 12 and

which lever is in turn coupled to a slidable member 13.

The slidable member 13 is capable of sliding movement along guide rails 14. The lever 12 is pivoted at a spindle 12a and it will be seen that by rotation of the shaft 8 to cause rotation of the cam 10 the slidable member 13 exhibits reciprocatory movement along the guide rails 14. Fixedly attached to the slidable member 13 is a cross bar 13a which bar forms part of an articulated frame shown generally at 13b. Pivotally attached to the cross bar 13a are a pair of parallel links 15 the upper ends of which are pivotally attached to a take-off member 16. Thus reciprocal movement of the slidable member 13 causes the articulated frame 13b and in particular the take-off member 16 to move in a direction towards and from the end carton of the stack of cartons 1. One end of the take-off member 16 is provided with a second cam follower in the form of a roller 17 which roller engages in a fixed cam slot 18 of a cam plate 18a. It will be seen that as the articulated frame 13b is reciprocated by the slidable member 13 the take-off member 16 is displaced laterally to the direction of reciprocation by the shape of the cam slot 18.

The take-off member 16 carries suction cups 19 which suction cups are positioned to engage with the end carton of the stack and, through rotation of the cam 10, can move downwardly and rightwardly in the drawing. The cam 10 is constructed such that it has a dwell period when the articulated frame 13b is in its downward position (i.e. away from the magazine) so that the take-off member 16 remains in its downward position for a certain period of the cycle of the shaft 8 before moving upwardly towards the stack of cartons.

In order for a flat carton to be quickly and easily deformed into its box like shape it is preferable for the flat carton to be opened slightly to admit air therein prior to the carton encountering an inclined surface during its movement through the apparatus which inclined surface causes the carton to be deformed into its box like shape. In the present example the take-off member 16 has a horizontal bar 20 positioned normal to the plane of the drawing, which bar stands proud of the suction cups 19 and is of such a length that, with the take-off member 16 in its upward position, it extends across the length of the stack of flat folded cartons 1.

Positioned beneath the magazine 1 to be substantially linear with the conveyor chains 5 are a pair of parallel transfer chains 21 to which are attached one or more flight bars 22. The chains 21 are carried on pairs of sprockets 23 and 23a and are driven by the sprockets 23 through a shaft 24 which shaft is geared to the shaft 9 so that the flight bar 22 moves forward one pitch in the same time as a rear flight 6 moves forward one pitch. In this example only one flight bar 22 is shown and the pitch distance of the flight mar 22 is considerably greater than that of rear flight 6 so that a carton is conveyed at a greater rate by transfer chains 21 than by conveyor chains 5.

Positioned between the magazine 2 and the transfer chains 21 are a pair of parallel breaker bars 25 the underside of which are provided with steps 25a and the ends adjacent the magazine 2 are provided with inclined surfaces 25b. It will be seen from the description of the apparatus given below that the breaker bars 25 can be inter-changed or adjusted as required so that they can be extended or retracted in accordance with the positioning of the members 2b of the magazine 2 to suit cartons of various widths. Linearly extending from the breaker bars 25 are a pair of parallel retaining bars 25c. The breaker bars 25 and the retaining bars 25c are positioned above the chains 21 and 5 so that the height A is slightly less than the height of a carton when fully erected and that the height B is slightly greater than the height of a carton when fully erected (see Fig. 1).

Operation of the apparatus will now be described with reference to Figs. 1 to 5 of the drawings. The shafts 8 and 9 are rotated to cause the slidable member 13 and consequently the suction cups 19 to move upwardly to engage the underside of the stack of cartons 1 and vacuum is automatically applied by a vacuum pump (not shown) to the suction cups 19. As above described the height of the bar 20 is slightly greater than that of the suction cups 19 so that when vacuum is applied to the underside of the bottom carton the carton is bent upwards in the centre as illustrated in Fig. 1. As the frame member 13b moves away from the stack of cartons under the influence of the cam 10, the bottom carton is extracted from the magazine 2 and due to the presence of the bar 20 it assumes the partly opened form as shown in Fig. 2. The pre-bending of the carton at C (Fig. 2), allows air to enter the carton thus facilitating erection of the carton as it contacts the breaker bar 25. Continued downward movement of the take-off member 16 causes the partly opened carton to encounter the inclined surfaces 25b of the breaker bars (as illustrated in Figs. 2 and 3) so that the flat folded carton is deformed into an erected state. If the flat carton was not slightly pre-opened as shown in Fig. 2 by the bar 20 then it would not be possible to extract and erect cartons at high speed since air would be unable to enter the carton and there is a possibility that the flat carton would fold back on itself instead of being erected into box form on encountering the

breaker bars 25. By encountering the breaker bars 25 the carton is deformed into its partially erected condition the geometry of which condition is a reverse parallelogram in cross-section and is a result of the carton blank being deformed into and passed its normal rectangular condition.

As the articulated frame 13b and carton move further from the magazine 2 under the action of the cam 10 the take off member 16 is urged rightwardly by the shape of the fixed cam slot 18 to deform the articulated frame 13b so that the carton remains in engagement with and is pushed beneath the breaker bars 25 (as illustrated in Fig. 4). At this point in the operation the vacuum in the suction cups 19 is released. The carton beneath the breaker bars 25 cannot however spring forward and resume a flat position similar to that shown in Fig. 2 since the height A is less than the height of the carton which must thus remain as a reverse parallelogram as illustrated in Fig. 4.

The transfer chains 21 are so phased that at this point the flight bar 22 contacts the back of the carton and moves it rapidly forward whilst the take-off member 16 and consequently the suction cups 19 remain in a downward position under the influence of the dwell period on cam 10 (see Fig. 4). The phase relationship between the transfer chains 21 and the conveyor chains 5 is arranged so that as flight 22 passes over the end sprocket 23a it leaves the carton in a position shown in Fig. 5 in such a manner that the forward end of the carton just contacts a front flight 7 whilst a rear flight 6 moves to contact the rear end of the carton. In this position the carton springs upwards into rectangular form beneath the step 25a of the breaker bars 25 but is prevented from springing flat again by the flights 6 and 7 which carry the carton forwards and maintain it in a rectangular form (see Fig. 5). It will be noted that in passing through the dealing and erecting apparatus the carton is at all times under complete control and is maintained under complete control during passage through the transfer mechanism by flight bars 6 and 7.

In order to maintain the same phase relationship beneath the moving parts of the apparatus for all sizes of cartons, it is necessary that the rear corner members 2a of the magazine 2 remain in the position shown relative to the axis of shaft 9, the front corner members 2b can however be adjusted relative to the rear members 2a as above described to suit cartons of various widths. Naturally when such adjustment is made the suction cups 19 are moved relatively towards or away from each other on the take-off member 16 as required. As a result of such adjustment when a carton is removed from the magazine the rear edge is always in the same plane so that the phase relationship between the flight bar 22 and the rear edge of the carton (the rear edge being that edge against which the flight bar 22 abuts) remains constant. Because of such phasing the flight bar 22 always leave a carton with the back edge of the carton in the same position (see Fig. 5) in relation to a rear flight 6.

The various widths of cartons are taken into account by adjustment of the third chain (not shown) which carries the front flights 7 relative to the conveyor chains 5 carrying the rear flights 6.

Since the apparatus shown in Fig. 1 is duplicated on either side of the carton handling machine one half of the machine is attached to a movable side frame (not shown) so that on movement of the side frame the one half of the machine moves relatively towards or away from the other half of the machine to adjust the articulated frame 13b, the transfer chains 21, the conveyor chains 5, the breaker bars 25 and retaining bars 25c to suit cartons of various lengths.

Fig. 6 shows a pair of cams 26 and 27 mounted on the shaft 8 for controlling the operation of two switches 28 and 29. The cams 26 and 27 are situated in substantially parallel planes and may be set to any required angular position relative to the shaft 8 or to each other. The cam 26 operates a microswitch 28 which microswitch is normally open, and cam 27 operates a microswitch 29 which microswitch is normally closed. In the electrical control circuit illustrated in Fig. 7 an on/off switch 34 is provided which switch is actuated by an operator either to extract or discontinue the flow of cartons from the magazine. The switch 34 is connected in series as shown with a mains input 35, microswitch 28 and a coil 30a of a relay 30. The relay 30 has two associated contacts 31 and 32 which contacts are closed by energisation of the coil 30a. The coil 30a is connected in series with the mains input through microswitch 29 and contact 31. The contact 32 is connected in series with an electro-magnetic vacuum valve 33 and mains input 35.

In operation assuming that the on/off switch 34 is closed to cause cartons to be dealt and erected, cam 26 eventually momentarily closes the microswitch 28 which in turn energises the relay 30 which closes contact 32 and energises the vacuum valve 33 to apply vacuum to the suction cups just before they contact the bottom carton of the stack. It will be noted that the contact 31 is also closed at this stage and the circuit is self sustaining so that the relay 30 and the vacuum valve 33 remain energised irrespective of the position of switch 34. If during this period the operator breaks switch 34 the vacuum valve remains energised until the circuit is broken by microswitch 29 under the influence of cam 27. On the next cycle

however, provided switch 34 still remains open no further cartons will be extracted.

In the above described embodiment the take-off member 16 forms part of an articulated frame member, which frame member is constructed as a parallelogram capable of being deformed to displace the take-off member laterally to the direction of reciprocation of the slidable member 13. It will be realised however that the carrying member 16 can conveniently be in the form of a cross-slide associated directly with the slidable member 13 so that it is capable of sliding movement on the slidable member 13 in a lateral direction to the direction of movement of the slidable member 13, thus a similar path of movement can be provided for the suction cups 16 to that above described.

It will be realised that for efficient handling of a carton by the apparatus it is necessary for the reciprocation of the take-off member 16 to be mechanically phased with the movement of the flights 22, 6 and 7 of the chain conveyors which conveyors form part of the transfer mechanism; similarly it is necessary that a flat carton once deformed into a substantially erected state by the inclined surfaces 25b remains in contact with the breaker bars 25 until it passes beneath the step 25a and is under the control of the flights 6 and 7.

The vacuum effected by the suction cups is controlled by valve means the operation of which is phased with the reciprocation of the take-off member 16 so as to leave the carton to the transfer mechanism, however, it will be realised that the vacuum control of the suction cups 19 may be effected in any manner well known in the art.

Several modifications may be made to the apparatus as above described without departing from the scope of the present invention for example the flat folded cartons may be delivered in a horizontal stack other than a vertical stack as illustrated or at any other desired angle in which cases the orientation of the remaining apparatus would be varied accordingly; the stack of flat folded cartons may be at an angle other than normal to the transfer mechanism in which case the take-off member 16 could be pivoted relative to the slidable member 13 and the shape of the cam slot 18 adjusted to provide both the necessary reciprocatory movement towards and away from the stack of cartons and the necessary lateral movement.

In the above described embodiment the conveyor constituted by the bands or transfer chains 21, sprockets 23 and 23a and flight bar or bars 22 is driven so that the chains 21 move continuously in one direction round the sprockets 23 and 23a. However, the bands or transfer chains 21 of the conveyor carried on the sprockets 23 and 23a can conveniently be reciprocally driven with forwards and backwards movement round the sprockets so that the flight bar or bars 22 are reciprocally moved in phase with the reciprocation of the take-off member. In this way the flight bar 22 does not have to pass underneath an erected or partially erected carton once that carton has been transferred by the conveyor but recedes away from the carton when it is delivered to the conveyor chains 5. The reciprocal movement of the band or transfer chains 21 can conveniently be achieved by driving the shaft 24 (which carries the sprocket 23) through a rack and pinion device, the rack being operated through a crank and a connecting rod geared to the shaft 9.

The charging and processing of cartons once delivered to the conveyor chains 5 and positioned between said chains and the retaining bars 25a is well known in the art and as such is not described herein.

Having regard to the provisions of Section 9 of the Patent Act, attention is directed to the claims of Patent No. 984,505.

WHAT WE CLAIM IS:—

1. Apparatus for dealing and erecting flat folded cartons from a stack which includes a take-off member carrying suction cups and arranged to reciprocate towards and from an end carton of the stack and to be displaced laterally of that direction during its reciprocatory movement; during the reciprocatory movement of the take-off member the cups being adapted to engage the end carton of the stack at the end of the approach stroke, withdraw the end carton from the stack during the recession stroke and during the recession stroke move the withdrawn carton so that part of the carton adjacent a folded edge thereof encounters at least one stationary breaker bar which first causes the substantially flat folded carton to be partially opened and further movement of the carton over the breaker bar or bars causes the carton to be further opened into an erect or partially erect condition and wherein the take-off member is displaced laterally during the recession stroke to maintain the carton in engagement with the breaker bar or bars and to cause the carton to be partially collapsed in the opposite direction to the direction in which it was collapsed whilst in the stack and in which, on disengagement of the suction cups, the carton is released to transfer mechanism and is maintained in its partially collapsed condition by the breaker bar or bars during initial movement of the carton by the transfer mechanism.

2. Apparatus as claimed in claim 1 wherein the take-off member forms part of an articulated frame which frame can move as a whole during the reciprocation and can

be deformed to move the cups laterally during reciprocation.

3. Apparatus as claimed in claim 2 wherein the geometry of the articulated frame comprises a deformable parallelogram.

4. Apparatus as claimed in claim 1 wherein the take-off member is constituted by a cross slide capable of lateral sliding movement normal to the direction of reciprocation of the take-off member.

5. Apparatus as claimed in any one of the preceding claims wherein reciprocation of the take-off member is effected by connecting it with a slidable member carried in guides and reciprocated towards and from the stack by means of a cam follower engaging with a rotatable cam.

6. Apparatus as claimed in any one of the preceding claims wherein the take-off member is displaced laterally of the direction towards and from the stack by a roller associated with the take-off member engaging with a fixed cam slot.

7. Apparatus as claimed in claim 5 wherein the rotatable cam is constructed to provide a dwell period in operation of the apparatus during which period the take-off member is at a position furthermost from the end carton of the stack.

8. Apparatus as claimed in any one of the preceding claims wherein the take-off member is provided with means for partially deforming the flat folded end carton of the stack on engagement between the cups and that carton whereby that carton is bent and opened sufficiently to admit air between opposing sides.

9. Apparatus as claimed in claim 8 wherein the means for partially deforming the end carton of the stack on engagement between the cups and the end carton is constituted by a bar located on the take-off member, and positioned to run lengthwise of the cartons and to abut the end carton so that this carton is partially bent over the bar on initial engagement by the cups.

10. Apparatus as claimed in any one of the preceding claims wherein a folded edge of a flat folded carton blank engaged by the cups encounters, during movement of the take-off member from the stack, an inclined surface of the breaker bar or bars.

11. Apparatus as claimed in any one of the preceding claims, wherein the breaker bar or bars are associated with a, or a first, conveyor of the transfer mechanism to which a partially collapsed carton in engagement with the breaker bar or bars is passed on disengaging with the breaker bar or bars and conveyed from the breaker bar or bars.

12. Apparatus as claimed in claim 11 wherein the breaker bar or bars are situated at an end part of retaining bars running parallel with the conveyor of the transfer mechanism between which retaining bars and conveyor an erected carton is conveyed.

13. Apparatus as claimed in claim 11 wherein a second conveyor is provided which forms part of the transfer mechanism, the take-off member being adapted to pass a partially collapsed carton to the second conveyor whilst said carton maintains engagement with the breaker bar or bars and the second conveyor conveys the carton to the first conveyor.

14. Apparatus as claimed in claim 13 wherein the second conveyor has at least one flight bar for engagement with and to impart movement to a partially collapsed carton passed thereto by the take-off member and the second conveyor is mechanically phased with reciprocation of the take-off member.

15. Apparatus as claimed in claim 14 wherein the second conveyor comprises a tranfer chain carried on sprockets or an endless band capable of being continuously driven, the band or transfer chain carrying the flight bar or bars which in operation are continuously moved by the band or chain in one direction in phase with the reciprocation of the take-off member.

16. Apparatus as claimed in claim 14 wherein the second conveyor comprises a transfer chain carried on sprockets or an endless band capable of being reciprocally driven with forwards and backwards movement, the band or transfer chain carrying the flight bar or bars which in operation are reciprocally moved by the band or chain in phase with the reciprocation of the take-off member.

17. Apparatus as claimed in any one of claims 13 to 16 wherein the suction of the cups is controlled by electrical means and is phased with reciprocation of the take-off member to pass a partially collapsed carton to the second conveyor of the transfer mechanism.

18. Apparatus as claimed in claim 11 in which the first conveyor includes a plurality of parallel conveyor chains at least one of which carries front flights for engaging with the leading end of an erected or partially erected carton passed thereto and at least one of which carries rear flights for engaging with the trailing end of the erected or partially erected carton so that an erected carton is carried by the first conveyor between the front and rear flights which maintain the carton in an erected condition.

19. Apparatus as claimed in claims 14 and 18 in which the flight bar or bars carried by the first conveyor is or are phased with the flights carried by the second conveyor so that the first conveyor receives cartons passed to it by the second conveyor.

20. Apparatus as claimed in either claim 18 or claim 19 wherein the distance between a rear flight and its associated front flight

is adjustable to accomodate cartons of a given width.

21. Apparatus as claimed in claim 20 wherein the front and rear flights are carried on separate chains which form part of the first conveyor, which chains are relatively adjustable in phase relationship to vary the distance between a rear flight and its associated front flight to accommodate cartons of a given width.

22. Apparatus as claimed in any one of the preceding claims wherein a magazine is provided in which the flat folded cartons are adapted to be stacked and which is adjustable to accommodate cartons of a given width.

23. Apparatus as claimed in any one of the preceding claims wherein the breaker bar or bars is or are adjustable or interchangeable relative to the take-off member to accommodate and permit use of the apparatus with cartons of a pre-determined width in the stack.

24. Apparatus as claimed in any one of the preceding claims wherein the width of the apparatus taken lengthwise of the stack of flat folded cartons is adjustable to accommodate cartons of a given length.

25. Apparatus as claimed in any one of the preceding claims wherein the flat folded cartons are adapted to be stacked vertically and withdrawn from the bottom of the stack, the transfer mechanism being situated below said stack whereby erected cartons are passed to the transfer mechanism and transferred by said mechanism in a substantially horizontal direction.

26. Apparatus as claimed in any one of the preceding claims wherein an electrical control circuit is provided which circuit ensures that when a flat fold carton has been removed from the stack the apparatus remains operative until the carton is located in the transfer mechanism in an erect condition.

27. Apparatus for dealing flat folded cartons from a stack thereof and erecting them substantially as herein described with reference to the accompanying diagrammatic drawings.

28. A method of dealing and erecting flat folded cartons from a stack thereof which includes the steps of engaging an end carton of the stack with suction cups and partially deforming the end carton during such engagement to admit air between its opposing sides; withdrawing that end carton from the stack; causing a part of the withdrawn carton adjacent a folded edge to encounter a stationary breaker bar during withdrawal of the carton from the stack; maintaining the withdrawing carton in engagement with the breaker bar until the carton is deformed into an erect or partially erect condition, and moving the erect or partially erect carton in a direction laterally to the direction of its withdrawal from the stack whilst maintaining the carton in engagement with the breaker arm to cause the carton to be partially collapsed in the opposite direction to the direction in which it was collapsed whilst in the stack and released the suction caps whilst maintaining the partially collapsed carton in engagement with the breaker bar to prevent spontaneous collapse of the carton prior to transferring the carton through a carton handling machine.

29. The method of dealing and erecting flat folded cartons from a stack thereof substantially as herein described.

30. Cartons when dispensed from a stack of flat folded cartons and erected by the method as claimed in either claim 28 or claim 29.

31. A carton handling machine incorporating apparatus for dealing flat folded cartons from a stack thereof and erecting them as claimed in any one of claims 1 to 27.

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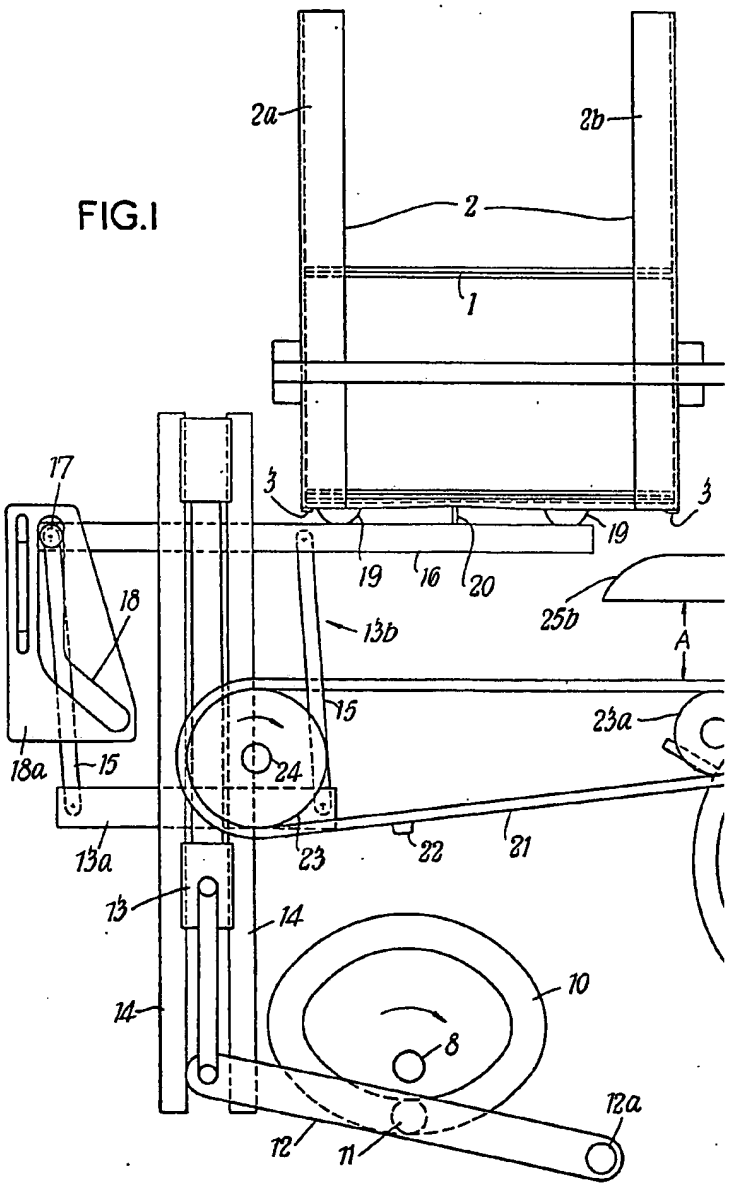
FIG.1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Sheet 1

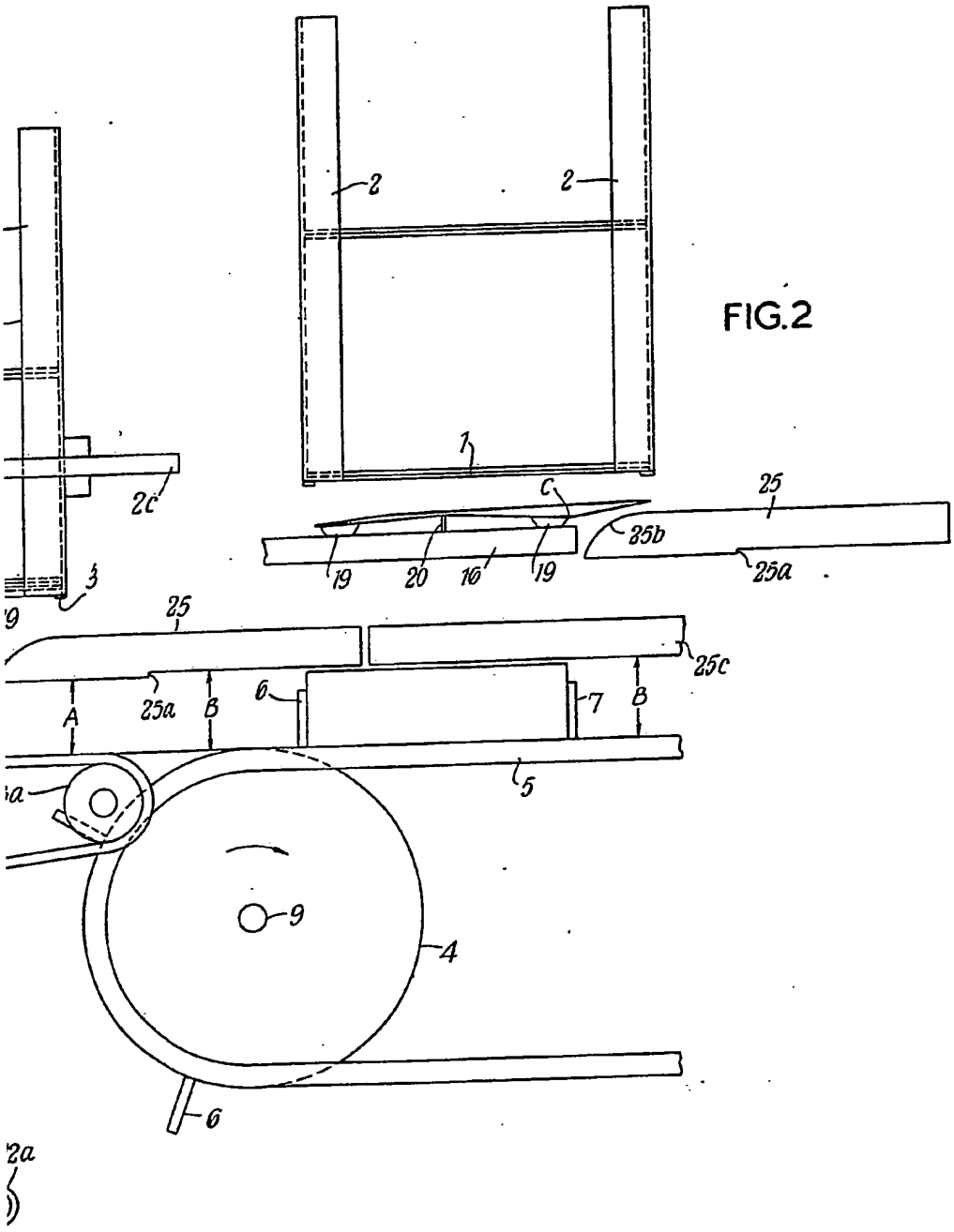

FIG.2

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Sheet 1

FIG.1

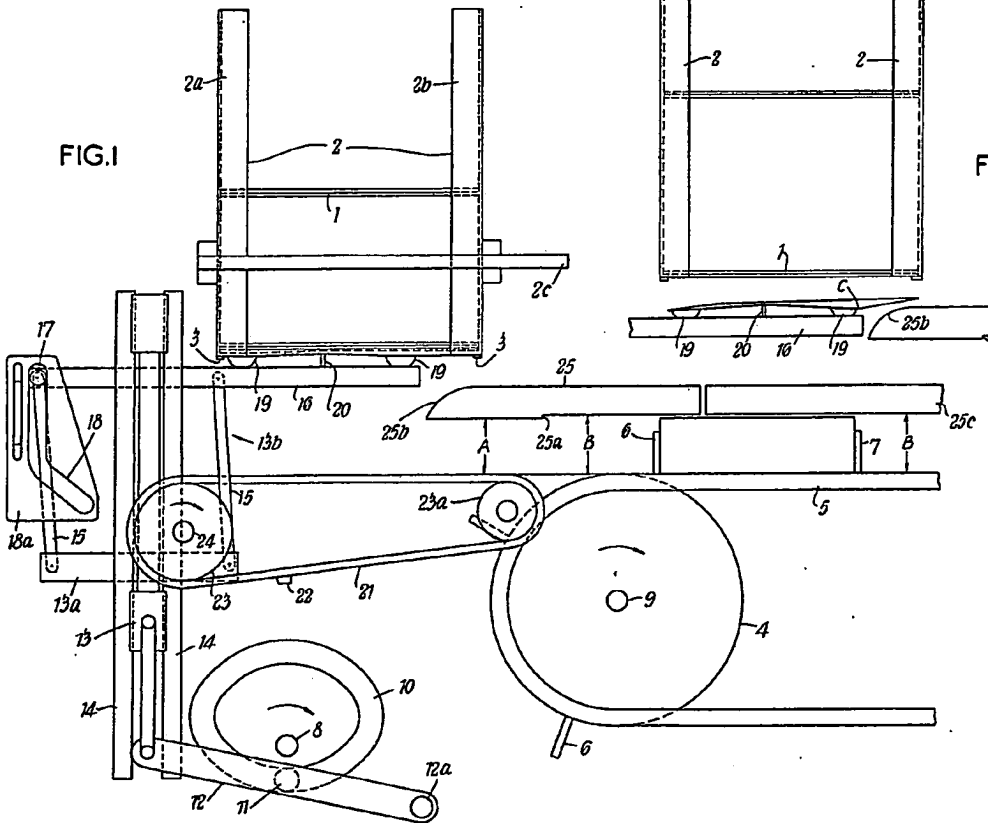
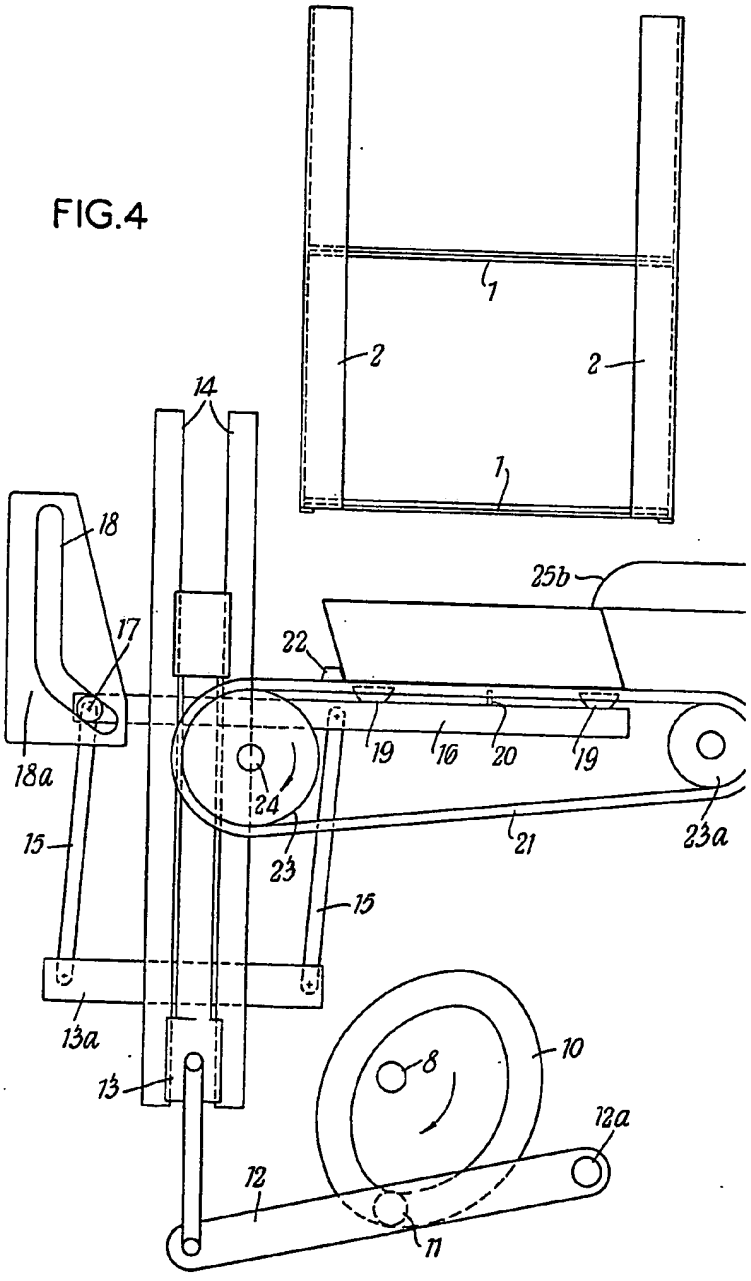


FIG.2

FIG.4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1152321 COMPLETE SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2

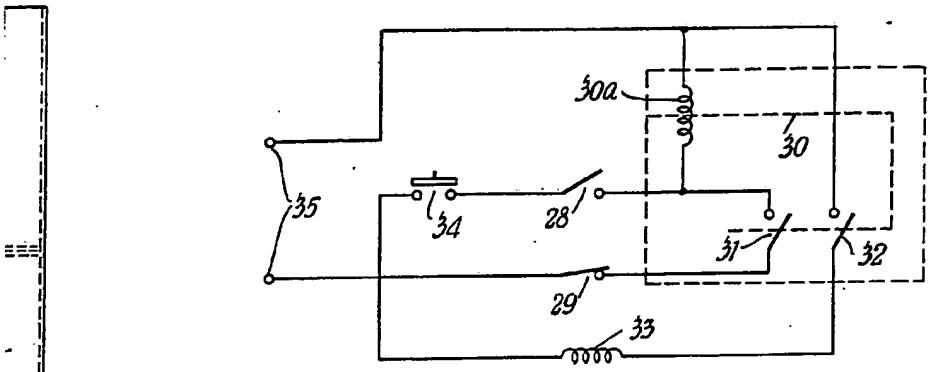

FIG.7

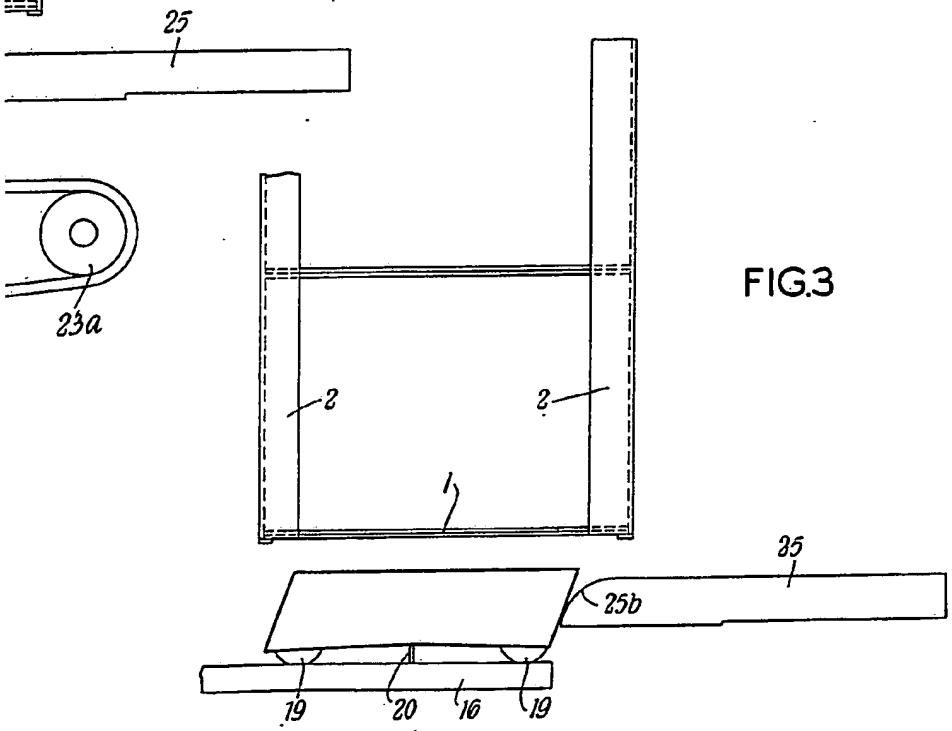

FIG.3

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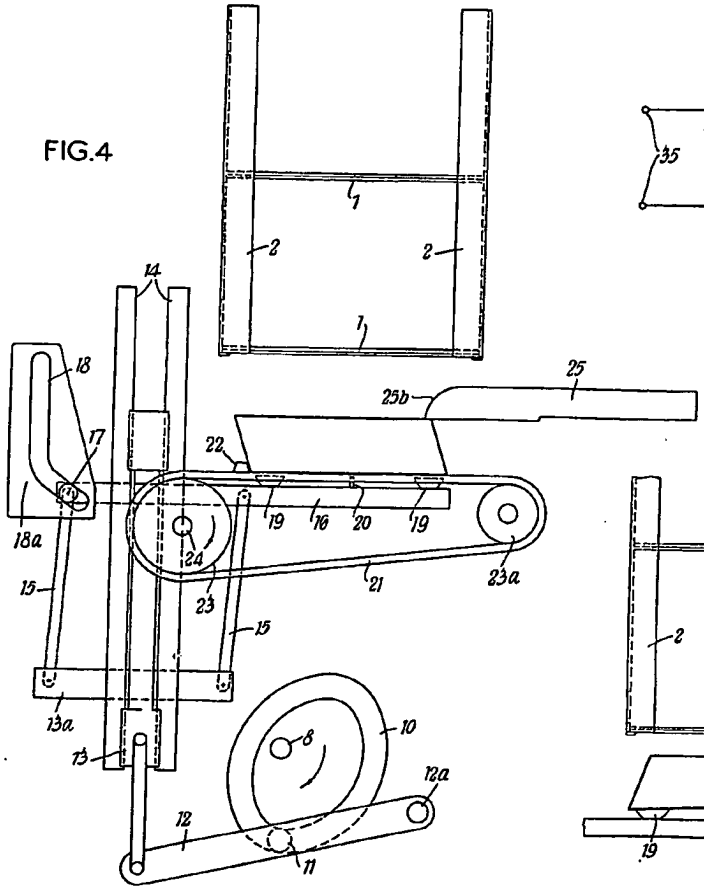
FIG.4



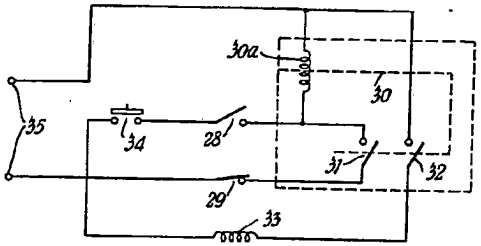


FIG.7

FIG.3

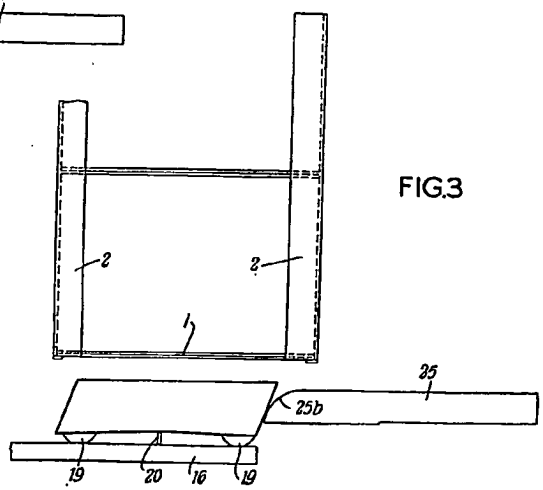
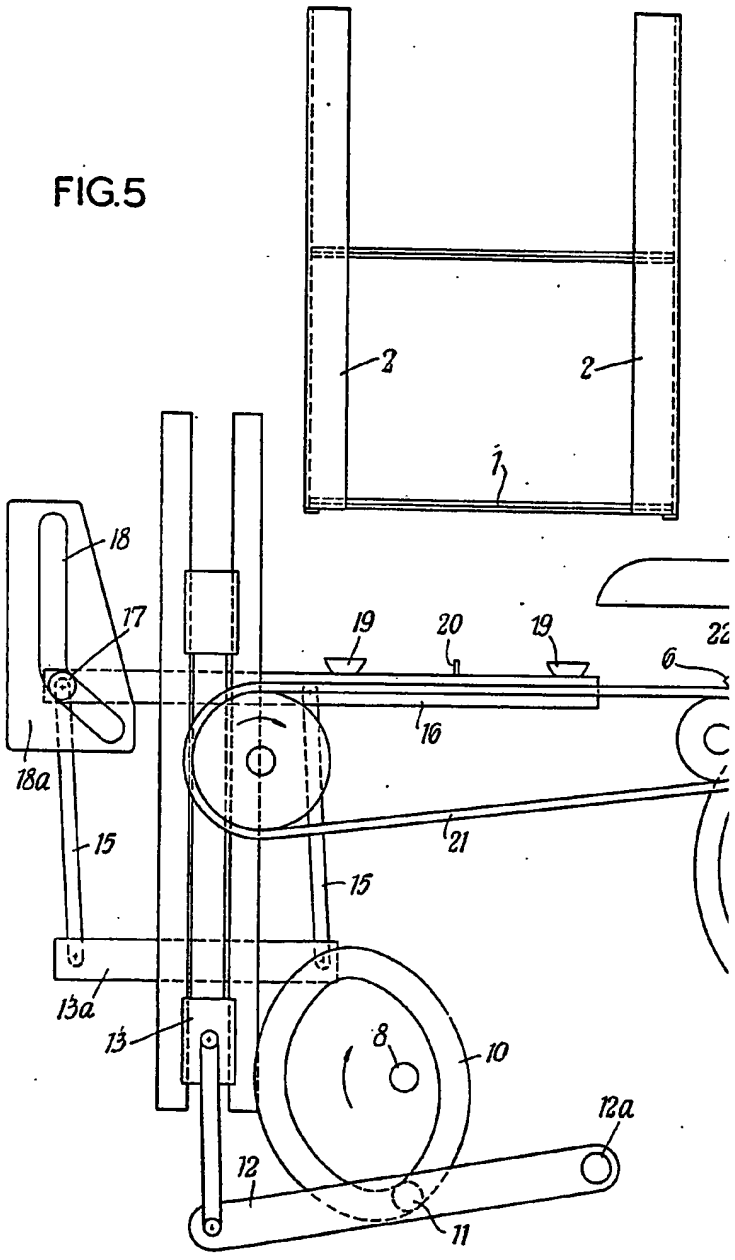


FIG.5



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Sheet 3

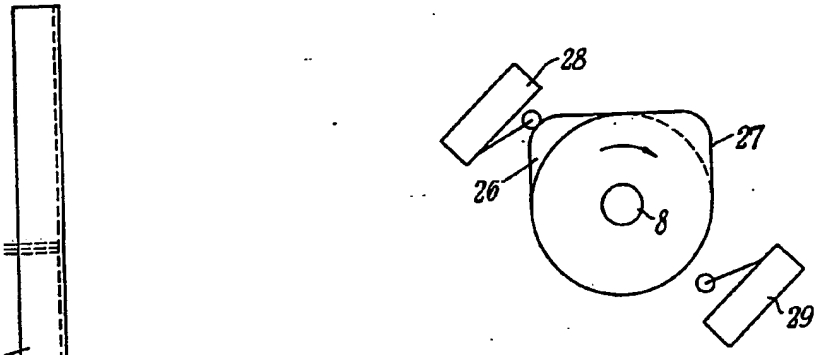

FIG.6

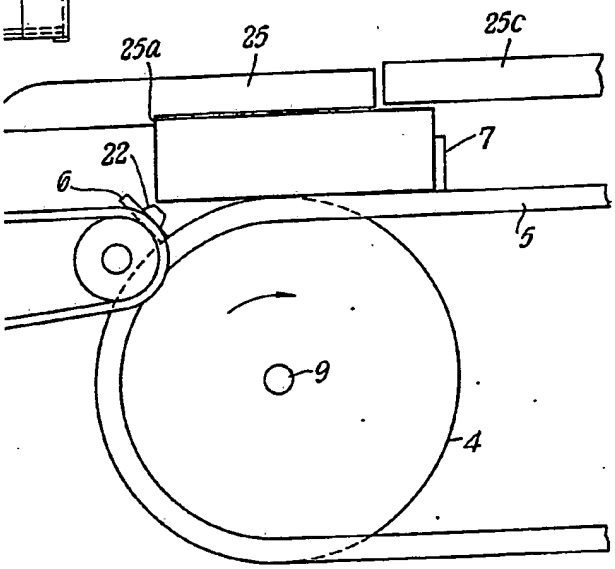

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FIG.5

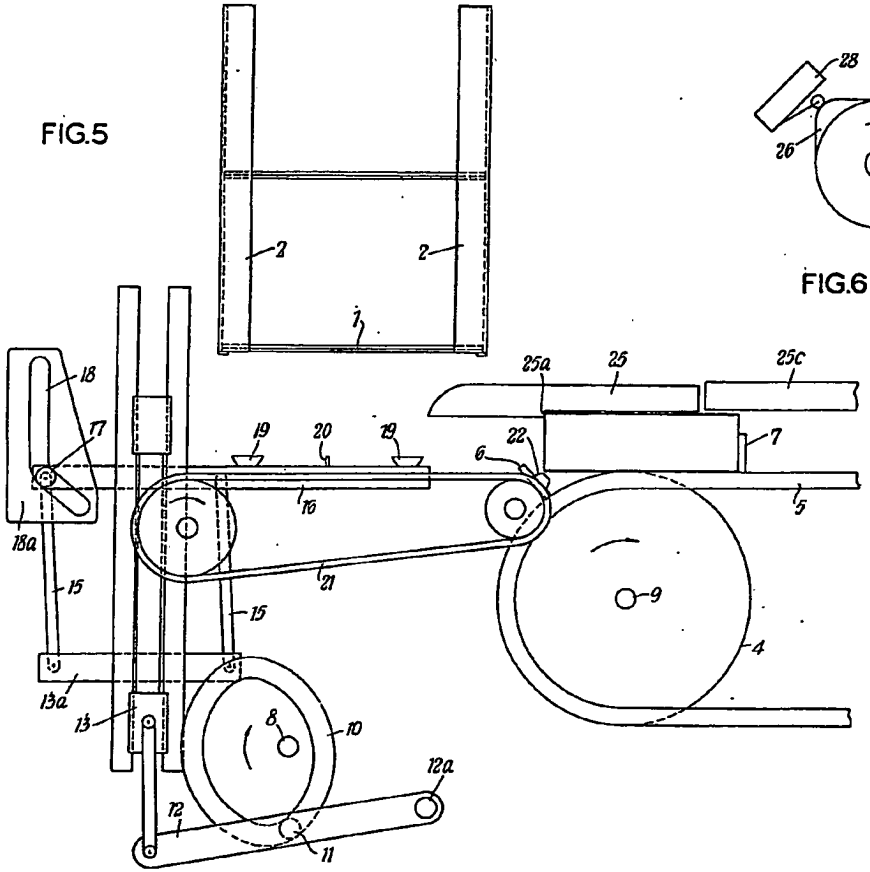
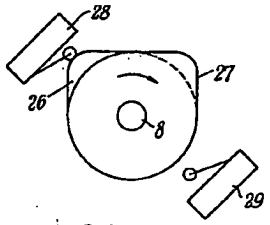


FIG.6



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